

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS

Claims 1-22 (canceled)

23. (Currently Amended) Method for optically detecting at least one entity chosen from the group consisting of molecules, molecule complexes, polymers, polymeric particles, particles built up from inorganic materials, vesicular structures, cells, bacteria and virus, whereby comprising:

- arranging the at least one entity ~~is arranged~~ on and/or in a substrate ~~(60)~~, said substrate ~~(60)~~ preferably being arranged on a support ~~(61)~~ and having a refraction-index which is different from the one of an at least one component adjacent to the substrate ~~(60)~~;
- scanning the at least one entity ~~is scanned~~ with a measuring volume ~~(70)~~ using at least one device being confocal or configured for multi-photon-excitation said device consisting of a first radiation source ~~(10)~~ and at least one first objective ~~(33)~~, thereby receiving measuring values of optical parameters which are processed by means of a signal processing for characterization of the at least one entity;
- the at least one entity substantially maintains its position with respect to the substrate ~~(60)~~ ~~or the support (61)~~ ~~or both~~ for the duration of the obtaining the measuring values,

- generating, before and/or during the scanning step, ~~process~~ an auxiliary focus (71) ~~is generated~~ by means of at least one second radiation source (11) and a second objective ~~objective~~ (34), said auxiliary focus (71) is at least partly arranged on the interface (62) between substrate (60) and adjacent component or on another interface (62) having a defined spacial relation to said entity;_i
- collimating the radiation generated by the first radiation source (10) ~~is collimated~~ by a first optic (33) and collimating the radiation generated by the second radiation source (11) ~~is collimated~~ by a second optic (31) being different from the first optic (33);_i
- detecting a retroreflection from the auxiliary focus (71) ~~is detected~~ by a detector (21) having a confocal arranged diaphragm (51) or by a plurality of detectors (21,22) ~~having~~ diaphragms (51,52) being arranged in front of and/or behind the image plane, and along the optical axis of the objective (34) generating the auxiliary focus (71), said retroreflection is used for measuring the position of the interface (62) and, thus, for indirectly positioning the measuring volume (70);_i and
- adjusting the position of the auxiliary focus (71) relative to the measuring volume (70) ~~is adjusted or adjustable~~ in a defined manner.

24. (Currently Amended) Method for optically detecting at least one entity chosen from the group consisting of molecules, molecule complexes, polymers, polymeric particles, particles built up from inorganic materials, vesicular structures, cells, bacteria and virus,

whereby comprising:

- arranging the at least one entity ~~is arranged~~ on and/or in a substrate (60), said substrate (60) ~~preferably being arranged on a support (61)~~ having a refraction-index which is different from the one of an at least one component adjacent to the substrate (60),
- scanning the at least one entity ~~is scanned~~ with a measuring volume (70) using at least one apparatus being confocal or configured for multi-photon-excitation said apparatus consisting of a first radiation source (10) and at least one objective (32), thereby receiving measuring values of optical parameters which are processed by means of a signal processing for characterization of the at least one entity,
- the at least one entity substantially maintained its position in respect to the substrate (60) ~~and/or the support (61)~~ for the duration of the recording,
- generating, before and/or during the scanning step, ~~process~~ an auxiliary focus (71) ~~is generated~~ by means of at least one second radiation source (11) and an optic (32), said auxiliary focus (71) is at least partly arranged on the interface (62) between substrate (60) and adjacent component or on another interface (62) having a defined spacial relation to said entity,
- collimating the radiation generated by the first radiation source (10) ~~is collimated~~ by a first optic (33) and collimating the radiation generated by the second radiation source (11) is collimated by a second optic (34) being different thereto,
- detecting a retroreflection from the auxiliary focus (71) ~~is detected~~ by a detector (21) having a confocal arranged

- diaphragm (51) or by a plurality of detectors (21,22) having diaphragms (51,52) being arranged in front of and/or behind the image plane, and along the optical axis of the objective (32) generating the auxiliary focus (71) said retroreflection is used for measuring the position of the interface (62) and, thus, for indirectly positioning the measuring volume-(70), and
- adjusting the position of the auxiliary focus (71) relative to the measuring volume (70) ~~is adjusted or adjustable~~ in a defined manner.

25. (Currently Amended) Method according to claim 23 ~~characterized in that~~ wherein the extent of the confocal detected volume of the auxiliary focus-(71), ~~in particular~~ in direction of the respective optical axes of the objectives (32,34) is smaller than the extent of the measuring volume-(70).

26. (Currently Amended) Method according to claim 25 ~~characterized in that~~ wherein the auxiliary focus (71) for obtaining a smaller extent of the confocal detective volume of the auxiliary focus (71) is generated by a second objective (34) having a numeric aperture which is larger than the numeric aperture of the first objective (32) used for generating the measuring volume-(70).

27. (Currently Amended) Method according to claim 25 ~~characterized in that~~ wherein for obtaining the small extent of the confocal detected volume of the auxiliary focus (71) a smaller part of the numerical aperture of a common optic or the respective optics

(32,34) is used for generating the measuring volume (70) than for generating the auxiliary focus (71).

28. (Currently Amended) Method according to claim 25 ~~characterized in that~~ wherein for obtaining the small extent of the confocal detected volume of the auxiliary focus (71) a confocal arranged diaphragm (51) is used at the detection of the auxiliary focus (71), said diaphragm (51) having a smaller opening than a confocal arranged diaphragm (50) used at the detection of the measuring volume (70).
29. (Currently Amended) Method according to claim 23 ~~characterized in that~~ wherein for indirectly positioning the measuring volume (70) the position of the auxiliary focus (71) relative to the interface (62) is moved ~~preferably periodically~~ substantially along the optical axis of the optic (34) generating the auxiliary focus (71), the intensity of the retroreflection in dependence on the movement of the detector (21) is registered and the position of the auxiliary focus (71) is readjusted in a manner that the intensity of the retroreflection reaches its maximum.
30. (Currently Amended) Method according to claim 23 ~~characterized in that~~ wherein for indirectly positioning the measuring volume (70) the position of the auxiliary focus (71) relative to the interface (72) is moved both, laterally to the optical axis of the optic (34) generating the auxiliary focus (71) and axially.
31. (Currently Amended) Method according to claim 29 ~~characterized in that~~ wherein the amplitude of the preferably

periodical movement of the auxiliary focus (71) is smaller than or equal to the axial extent of the measuring volume (70).

32. (Currently Amended) Method according to claim 23 ~~characterized in that~~ wherein the intensity of the retroreflection is detected by means of at least two detectors (21,22) and the position of the interface (62) is determined by means of the distribution of the intensities detected by the detectors (21,22).
33. (Currently Amended) Method according to claim 23 ~~whereby~~ wherein the scatter-light-intensity and/or the scatter-light-intensity in dependence on the polarization and/or the fluorescence-intensity at at least one wavelength and/or the fluorescence-intensity in dependence on the polarization and/or the fluorescence-durability and/or molecular luminosity and/or Raman-scattering and/or luminescence are detected as optical parameters.
34. (Currently Amended) Method according to claim 23 ~~whereby~~ wherein, in said step of arranging the at least one entity on and/or in a substrate, said substrate is a mineral or organic substrate chosen from the group consisting of substrates (60) in particular a polymeric gel-gels, a polymeric particle particles built up from inorganic material-materials, a vesicular structure-structures, a cell cells, a bacterium bacteria and and a virus are used.
35. (Currently Amended) Method according to claim 23 ~~characterized in that~~ wherein entities and/or substrates (60) selected by means of the optical parameters are separated during or

after the scanning process from the other entities and/or substrates
(60).

36. (Currently Amended) ~~Use of the~~ The method according to claim 23 for use in the research of active ingredients, in the functional analysis of combinatoric-chemical or combinatoric-biological synthesis-products in the functional genom-analysis, in the evolutive biotechnology, in the diagnostics, in the proteom-analysis or the investigation of material.
37. (Currently Amended) Apparatus for performing the method according to claim 23 for optically detecting at least one entity chosen from the group consisting of molecules, molecule complexes, polymers, polymeric particles, particles built up from inorganic materials, vesicular structures, cells, bacteria or virus, comprising:
- at least one first radiation source (10) as well as at least one device being confocal or configured for multi-photon-excitation said device comprising a first objective (32) and at least one first detector (20) for detecting measuring values from the measuring volume-(70);
 - at least a second radiation source (11) as well as at least one further device comprising a second objective (34) and at least one second detector (21) for detecting a retroreflection from an auxiliary focus-(71), said second detector (21) having a confocal arranged diaphragm-(51), or a plurality of second detectors (21,22) for detecting a retroreflection from an auxiliary focus (71), said second detectors (21,22)-having diaphragms (51,52) arranged in front of and/or behind the image plane, and along

the optical axis of the second objective (34) generating the auxiliary focus (71)_i;

- at least one device for positioning measuring volume (70) and auxiliary focus (71) relative to a substrate (60)_i;
- a device for variably positioning the auxiliary focus (71) relative to the measuring volume (70)_i;
- a first optic (33) collimating the radiation generated by the first radiation source (10)_i; and
- a second optic (31) being different from the first optic (33) collimating the radiation generated by the second radiation source (11).

38. (Currently Amended) Apparatus for performing the method according to claim 23 for optically detecting at least one entity comprising chosen from the group consisting of molecules, molecule complexes, polymers, polymeric particles, particles built up from inorganic material, vesicular structures, cells, bacteria or virus having

- at least one first radiation source (10) as well as at least one device being confocal or configured for multi-photon-excitation said device comprising an objective (32) and at least one first detector (20) for detecting measuring values from a measuring volume (70),
- at least one second radiation source (11) as well as at least one further device comprising the same objective (32) and a second detector (21) for detecting a retroreflection from an auxiliary focus (71), the second detector (21) having a confocal arranged diaphragm (51), or a plurality of second detectors (21,22) for

- detecting a retroreflection from an auxiliary focus ~~(71)~~, said second detectors ~~(21,22)~~ having diaphragms ~~(51,52)~~ arranged in front of and/or behind the image plane and along the optical axis of the objectives ~~(32)~~ generating the auxiliary focus ~~(71)~~,
- at least one device for positioning the measuring volume ~~(70)~~ and auxiliary focus ~~(71)~~ relative to the substrate ~~(60)~~,
 - a device for relative positioning the auxiliary focus ~~(71)~~ relative to the measuring volume ~~(70)~~,
 - a first optic ~~(33)~~ collimating the radiation generated by the first radiation source ~~(10)~~, and
 - a second optic ~~(31)~~ different from the first optic ~~(33)~~ collimating the radiation generated by the second radiation source ~~(11)~~.

39. (Currently Amended) Apparatus for performing the method according to claim 23 for optically detecting at least one entity chosen from the group consisting of molecules, molecule complexes, polymers, polymeric particles, particles built up from inorganic material, vesicular structures, cells, bacteria or virus having

- at least one first radiation source ~~(10)~~ as well as at least one device being confocal or made for multi-photon-excitation consisting of a first objective ~~(32)~~ and at least one first detector ~~(20)~~ for detecting measuring values from a measuring volume ~~(70)~~,
- at least a second radiation source ~~(11)~~ as well as at least one further device comprising a same objective ~~(32)~~ and a second detector ~~(21)~~ for detecting a retroreflection from an auxiliary focus ~~(71)~~, said second detector ~~(21)~~ having a confocal arranged diaphragm ~~(51)~~, or a plurality of second detectors ~~(21,22)~~ for

detecting a retroreflection from an auxiliary focus ~~(71)~~, said second detectors ~~(21,22)~~ having diaphragms ~~(51,52)~~ arranged in front of and/or behind the image-plane and along the optical axis of the second objectives ~~(34)~~ generating the auxiliary focus ~~(71)~~,

- at least one device for positioning the measuring volume ~~(70)~~ and auxiliary focus ~~(71)~~ relative to a substrate ~~(60)~~,
- whereby the auxiliary focus ~~(71)~~ is adjusted relative to the measuring volume ~~(70)~~ in a defined manner,
- a first optic ~~(33)~~ collimating the radiation generated by the first radiation source ~~(10)~~, and
- a second optic ~~(31)~~ being different from the first optic ~~(33)~~ collimating the radiation generated by the second radiation source ~~(11)~~.

40. (Currently Amended) Apparatus according to claim 37 ~~characterized in that~~ wherein the device for positioning the measuring volume ~~(70)~~ and the auxiliary focus ~~(71)~~ relative to the substrate ~~(60)~~ comprises means for positioning the auxiliary focus ~~(71)~~ relative to the measuring ~~(70)~~.

41. (Currently Amended) Apparatus according to claim 37 ~~characterized in that~~ wherein the device for positioning the auxiliary focus ~~(71)~~ relative to the measuring volume ~~(70)~~ comprises means for adjusting the relative position of the objectives ~~(32,34)~~ to each other.

42. (Currently Amended) Apparatus according to claim 37 ~~characterized in that wherein~~ the device for positioning the auxiliary focus (71) relative to the measuring volume (70) comprises means for variation of the convergence of those bundles of rays that are ~~focussed~~ focused by the respective objective (32,34) for generation of the auxiliary focus (71) and the measuring volume (70).
43. (Currently Amended) ~~Use of the~~ The apparatus according to claim 37 for use in the research of active ingredients, in the functional analysis of combinatoric-chemical or combinatoric-biological syntheses-products, in the functional genon-analysis, in the evolutive biotechnology, in the diagnostics, in the proteon-analysis or the examining of material.
44. (New) Method according to claim 23, wherein said substrate is arranged on a support.
45. (New) Method according to claim 24, wherein said substrate is arranged on a support.
46. (New) Method according to claim 29, wherein for indirectly positioning the measuring volume the position of the auxiliary focus

relative to the interface is moved periodically substantially along the optical axis of the optic generating the auxiliary focus.